

## TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

### PTR SECTION STAFF GUIDANCE

## USE OF CHLORINE DIOXIDE

**Rule Affected:** Title 30 Texas Administrative Code (30 TAC) §290.42(e)(3)(G)

### **Background:**

Chlorine dioxide (ClO<sub>2</sub>) is an extremely powerful oxidant that can be used to improve the aesthetic, chemical, and microbiological quality of drinking water. The proper use of ClO<sub>2</sub> can reduce taste and odor complaints, improve iron and hydrogen sulfide concentrations, and improve the coagulation process at surface water treatment plants. It does not form halogenated disinfection by-products such as trihalomethanes and haloacetic acids and is a very effective disinfectant. However, elevated levels of ClO<sub>2</sub> and its principal by-product, chlorite, can have their own adverse health effects. Consequently, the Texas Commission on Environmental Quality (TCEQ) has adopted the following guidance to ensure that only well-operated, high-efficiency ClO<sub>2</sub> generators are utilized by public water systems.

### **Guidance:**

1. Before placing a chlorine dioxide generator into service, a utility must submit a detailed written proposal to the TCEQ. The submittal must include:
  - a. The name and specifications for the chlorine dioxide generator proposed for use (the unit must provide a minimum of 95% efficiency as specified in 30 TAC §290.42(e)(4)(G)).
  - b. Information regarding other U.S. potable water installations of the proposed unit.
  - c. Information on the operation and maintenance training program.
  - d. The expected total applied dosage of chlorine dioxide and other disinfectants as well as the points of application for all disinfectants and the type and amount of residuals and by-products expected in the distribution system.
  - e. Name and qualifications of the individual(s) expected to perform routine analytical efficiency testing.
  - f. A description of the containment facilities for the sodium chlorite tanks. Containment facilities for a single container or for multiple, or interconnected containers must be large enough to hold the maximum amount of chemical that can be stored with a minimum freeboard of six vertical inches or to hold 110% of the total volume of the container(s), whichever is less, as specified in 30 TAC §290.42(d)(6)(E).
  - g. The chlorine gas equipment must have a capacity of at least 50% greater than the highest expected dosage to be applied at any time as specified in 30 TAC §290.42(e)(3)(A).
2. Upon approval for the use of chlorine dioxide, the system will receive a ClO<sub>2</sub> Verification Form from the TCEQ. Once all employees at the system that will be

handling CLO<sub>2</sub> have been properly trained on the equipment, this form must be signed by a manager or the operator in charge and returned to the TCEQ.

3. Sealed, signed, and dated engineering plans and specifications are required to be submitted for review and approval prior to construction for any additional equipment for which the facility has not received previous TCEQ approval, as specified in 30 TAC §290.39(j)(1)(A). Please submit plans and specifications to the address below:

Utilities Technical Review Team (MC 159)  
Texas Commission on Environmental Quality  
P.O. Box 13087  
Austin, Texas 78711-3087

Please include with the submittal a copy of this staff guidance document and a completed TCEQ [Plan Review Submittal Form](#)<sup>i</sup>.

4. The system must ensure water operators maintain a free chlorine residual of at least 0.2 milligrams per liter (mg/L) or a chloramine residual of 0.5 mg/L (measured as total chlorine) in the far reaches of the distribution system at all times as specified in 30 TAC §290.46(d)(2). The chlorine dioxide residual of the water entering the distribution system must not exceed a maximum residual disinfectant level (MRDL) of 0.8 mg/l. The chlorite concentration residual of the water entering the distribution system must not exceed a MRDL of 1.0 mg/l.
5. The system must comply with the chlorine dioxide and chlorite monitoring requirements detailed in the *Summary of Additional Monitoring and Reporting Requirements for Public Water Systems Using Chlorine Dioxide* document. This document is included in the letters to systems granting exceptions for the use of chlorine dioxide.
6. Before placing any treatment plant in service with chlorine dioxide disinfectant, a calculated disinfectant contact time (CT) analysis must be performed to demonstrate that each surface water treatment plant can achieve a 2.0-log removal or inactivation of *Cryptosporidium* oocysts, a 3.0-log removal or inactivation of *Giardia*, and a 4.0-log removal or inactivation of viruses.

The revised CT study must be submitted to:

CT Study Program Coordinator  
Technical Review and Oversight Team (MC-159)  
Texas Commission on Environmental Quality  
P.O. Box 13087  
Austin, TX 78711-3087

The CT study template can be downloaded at the TCEQ [website](#)<sup>ii</sup>.

7. The system must develop and submit a revised “Monitoring Plan” that includes the chlorine dioxide and chlorite monitoring locations as required in 30 TAC §290.121. Further information can be found in Regulatory Guidance (RG) 384 “How to Develop a Monitoring Plan for a Public Water System” and at the TCEQ’s [website](#)<sup>iii</sup>:

Please submit an updated monitoring plan to the address below:

Monitoring Plan Coordinator (MC-155)  
Texas Commission on Environmental Quality  
P.O. Box 13087  
Austin, TX 78711-3087

8. All systems using CLO<sub>2</sub> as a disinfectant must complete and submit a Chlorine Dioxide Monthly Operating Report (CLO<sub>2</sub>MOR). The Chlorine Dioxide MOR (TCEQ-0690) is an Excel97 spreadsheet that automatically performs calculations. An electronic copy as well as the instructions for completing the CLO<sub>2</sub>MOR can be downloaded at the TCEQ [website](#)<sup>iv</sup>:

Please note that per this document, the following monitoring requirements are imposed on systems using chlorine dioxide:

- a) The system must complete a CLO<sub>2</sub>MOR for each entry point supplying water with chlorine dioxide to the distribution system. If all of the treatment plants utilizing CLO<sub>2</sub> lead to the same entry point, then the system will only have to fill out one CLO<sub>2</sub>MOR per month. If a system has multiple plants utilizing CLO<sub>2</sub> and the effluent from each plant flows to the distribution system through a different entry point, the system will need to complete a CLO<sub>2</sub>MOR for each entry point from each plant.
- b) Per the CLO<sub>2</sub>MOR instructions, the system must perform the following sampling for each entry point through which water containing chlorine dioxide flows:
  - i. The system must collect one sample per day from the point of entry (POE) to be analyzed for CLO<sub>2</sub>. If the CLO<sub>2</sub> residual is 0.8 mg/L or greater at the POE, the system must collect three samples from the distribution system to be analyzed for CLO<sub>2</sub>. The locations and timeframes for the collection of these samples can be found in the CLO<sub>2</sub>MOR instructions.
  - ii. The system must collect one sample per day from the POE to be analyzed for chlorite. If the chlorite residual is 1 mg/L or greater at the POE, the system must collect three distribution samples within 24 hours and have them analyzed for chlorite. The locations for these sample collections are listed in the CLO<sub>2</sub>MOR instructions. The only exception to this “3-sample” chlorite distribution requirement is for systems which have written approval for a reduced chlorite monitoring schedule.
9. The system must identify the location of the reduced-pressure zone backflow prevention assemblies to be installed on the potable water feed line(s) for the chlorine dioxide. Make-up water supply lines to chemical-feeder solution-mixing chambers shall be provided with an air gap or other acceptable backflow prevention device, as specified in 30 TAC §290.42(d)(2)(C).
10. Amperometric titrators must be equipped with platinum-platinum electrodes as specified by the requirement in 30 TAC §290.110(d)(5).
11. The system shall ensure that the gas chlorination facility meets the applicable requirements listed in 30 TAC§290.42(e) and (f). All chemical storage and feed facilities must comply with 30 TAC §290.42(f)(2)

12. All chemicals used in the generation of chlorine dioxide must conform to American National Standards Institute/National Science Foundation Standard 60 and be certified by a testing organization accredited by ANSI as specified in 30 TAC §290.42(j).

*Finalized and Approved by:*

*Ada Lichaa P.G., Plan and Technical Review Section Manager, 9/23/2013*

If no formal expiration date has been established for this staff guidance, it will remain in effect until superseded or canceled.

***Revision History:***

<b>Date</b>	<b>Action</b>	<b>Action by</b>
9/8/1998	Approved	Charles Maddox
6/3/2013	Revised	Sylvana (Sam) Turner
09/4/2013	Revised	Joel Klumpp
09/20/2013	Revised	Ada Lichaa
09/23/2013	Approved	Ada Lichaa
6/10/2014	Revised Format	Tamira Konkin-Garcia

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<sup>i</sup> <http://www.tceq.state.tx.us/assets/public/permitting/watersupply/ud/forms/10233.pdf>

<sup>ii</sup> [http://www.tceq.texas.gov/drinkingwater/swmor/swmor/ct\\_info](http://www.tceq.texas.gov/drinkingwater/swmor/swmor/ct_info)

<sup>iii</sup> [https://www.tceq.texas.gov/drinkingwater/presentations/monitoring\\_plans/monplan.html](https://www.tceq.texas.gov/drinkingwater/presentations/monitoring_plans/monplan.html)

<sup>iv</sup> <https://www.tceq.texas.gov/drinkingwater/swmor/swmor/swmor-forms-and-instructions#CLO2MOR>